In the Claims

What is claimed is:

1. (Original) A method of assessing diffusion of a substance in a region-of-interest comprising the steps of:

(A) determining an average diffusion value in at least one voxel;

(B) determining a respective diffusion value for one or more diffusion directions in the at least one voxel; and

(C) from the respective diffusion values and the average diffusion value, determining a diffusion index indicative of diffusion in the at least one voxel.

2. (Original) The method of claim 1 further comprising the step of selecting one voxel and determining a fractional anisotropic diffusion value in the one voxel by determining a normalized standard deviation of diffusion along the one or more diffusion directions in the selected voxel.

3. (Original) The method of claim 1 wherein the at least one voxel includes two adjacent voxels and further comprising the step of determining a metric related to the diffusion anisotropy in each voxel and the angle difference between the primary diffusion directions.

4. (Original) The method of claim 3 further comprising the step of determining fractional anisotropic diffusion value for the other voxel and multiplying the fractional anisotropic diffusion value of the one voxel to the fractional anisotropic diffusion value of the other voxel, and determining the angle difference from the respective fractional anisotropic diffusion values and the diffusion index.

5. (Original) The method of claim 4 further comprising the step of determining if diffusion in the two adjacent voxels is anisotropic and if the diffusion in each voxel is commonly aligned.

6. (Original) The method of claim 1 further comprising the steps of:

determining diffusion in the at least one voxel relative to two or more axes of reference;

comparing diffusion in the at least one voxel along the two or more axes of reference; and from the comparison

determining the direction which best correlates to diffusion in the at least one voxel.

7. (Original) The method of claim 6 further comprising the step of displaying, with color-coding, diffusion relative to each axis in an image.

8. (Original) The method of claim 1 further comprising the step of determining a diffusion anisotropy index without fitting diffusion data to a tensor model.

9. (Original) The method of claim 1 further comprising the step of repeating steps (A) – (C) for another at least one voxel.

10. (Original) The method of claim 1 wherein the one or more diffusion directions include more than six diffusion directions in the at least one voxel.

11. (Original) An MRI apparatus comprising:

a magnetic resonance imaging (MRI) system having a plurality of gradient coils positioned about a bore of a magnet to impress a polarizing magnetic field and an RF transceiver system and an RF switch controlled by a pulse module to transmit RF signals to an RF coil assembly to acquire MR images; and

a computer programmed to:

access diffusion-weighted imaging data from a region-of-interest;

isolate at least two adjacent voxels within the region-of-interest; and

determine a metric indicative of diffusion along multiple directions in the at least two adjacent voxels without fitting diffusion-weighted imaging data from the at least two adjacent voxels to a tensor model.

12. (Original) The MRI apparatus of claim 11 wherein the computer is further programmed to select one of the at least two adjacent voxels and determine fractional anisotropic diffusion in the one voxel.

13. (Original) The MRI apparatus of claim 11 wherein the metric is defined by:

$$G(A,B) = \frac{\sum_{n=1}^{N}\left[(a_n - \bar{a})(b_n - \bar{b})\right]}{\sqrt{\sum_{n=1}^{N} a_n^2 \sum_{n=1}^{N} b_n^2}}; \text{ and}$$

wherein (a_n) and (b_n) are the diffusion values measured in N different directions for voxels A and B, and $\bar{a}$ and $\bar{b}$ are the respective average diffusion values.

14. (Original) The MRI apparatus of claim 13 wherein a value of anisotropic diffusion in the one voxel is defined by:

$$G_{AA} = \sqrt{G(A,A)} = \frac{\sqrt{\sum_{n=1}^{N}\left[(a_n - \bar{a})^2\right]}}{\sqrt{\sum_{n=1}^{N} a_n^2}}.$$

15. (Original) The MRI apparatus of claim 11 wherein the computer is further programmed to determine a smoothing coefficient to reduce noise in the at least two adjacent voxels.

16. (Original) A computer readable storage medium having stored thereon a computer program representing a set of instructions, which when executed by a computer, causes the computer to:

determine an individual diffusion value for each of N diffusion directions in at least one voxel;

determine an average diffusion value for the at least one voxel; and

determine a diffusion index indicative of diffusion anisotropy and diffusion direction in the at least one voxel.

17. (Original) The computer readable storage medium of claim 16 wherein the set of instructions further causes the computer to:

determine diffusion in the at least one voxel relative to two or more axes of reference;

compare diffusion in the at least one voxel along the two or more axes of reference; and from the comparison

determine which direction which best correlates to diffusion in the at least one voxel.

18. (Original) The computer readable storage medium of claim 16 wherein N includes more than six diffusion directions.

19. (Original) The computer readable storage medium of claim 16 wherein the set of instructions further causes the computer to determine the diffusion index without fitting diffusion data to a tensor model.

20. (Original) The computer readable storage medium of claim 16 wherein the set of instructions further causes the computer to determine a smoothing coefficient to reduce noise in adjacent voxels.